# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **10-104642**

(43)Date of publication of application : **24.04.1998**

(51)Int.Cl. **G02F 1/1341**
**G02F 1/1339**

(21)Application number : **08-255647**

(22)Date of filing : **27.09.1996**

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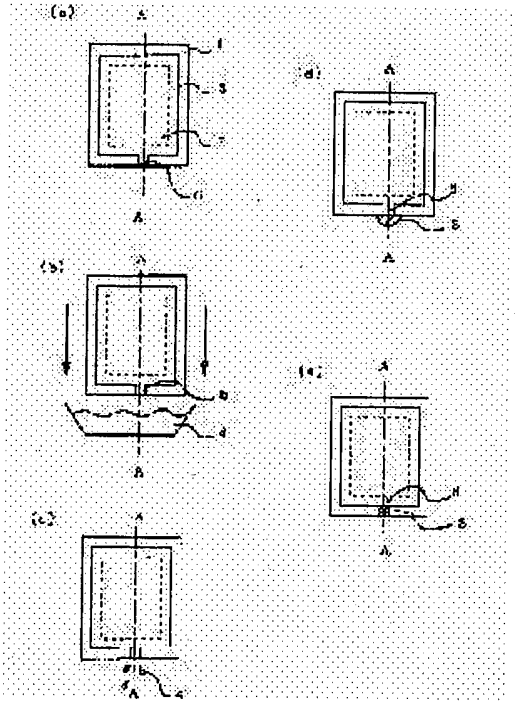
## (54) PRODUCTION OF LIQUID CRYSTAL PANEL

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a liquid crystal panel which obviates the occurrence of a sealing error, has the excellent uniformity of the gap between substrates and is strong to an external press without the occurrence of display unevenness by applying a sealing resin near a liquid crystal injection port while maintaining a liquid crystal extruding pressure, then dropping the pressure down to a resin withdrawing pressure.

SOLUTION: A pair of the substrates 1 injected with the liquid crystals 4 are held by pressure sealing jigs and the substrate 1 surfaces are pressurized under the prescribed pressure and are held for a specified time in order to discharge the excessively injected liquid crystals 4. Next, the pressure in the pressure sealing jigs is slightly dropped to withdraw the sealing resin 8 into the liquid crystal injection port 6 and is held for the specified time, by which the sealing resin 8 is cured. The pressurizing force to the substrates 1 after the liquid crystal injection is set in two stages; the liquid crystal extruding pressure and the resin withdrawing pressure lower than the pressure. The sealing resin 8 applied near the liquid crystal injection port 6 is withdrawn to the liquid crystal injection port 6 by the difference in the pressures and is then cured and, therefore, the sealing error is prevented.



LEGAL STATUS

| | |
|---|---|
| [Date of request for examination] | 28.01.2000 |
| [Date of sending the examiner's decision of rejection] | 10.07.2001 |
| [Kind of final disposal of application other than the examiner's decision of rejection or application converted registration] | |
| [Date of final disposal for application] | |
| [Patent number] | 3447485 |
| [Date of registration] | 04.07.2003 |
| [Number of appeal against examiner's decision of rejection] | 2001-14030 |
| [Date of requesting appeal against examiner's decision of rejection] | 09.08.2001 |
| [Date of extinction of right] | |

* NOTICES *



## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the liquid crystal impregnation closure method of a liquid crystal panel in more detail about the manufacture approach of a liquid crystal panel.
[0002]
[Description of the Prior Art] In fields, such as a portable information terminal equipment and a notebook computer, development of a flat-panel display is performed briskly and development of a liquid crystal panel in which the description especially of a light weight, small, and a low power was employed efficiently is performed briskly.
[0003] Opposite arrangement of the translucency substrates 101 and 102 with which the electrode which is not illustrated as the conventional common liquid crystal panel is shown in drawing 4 , signal wiring, etc. were formed is carried out through a sealant 105 and the spacer which is not illustrated, and it has come to pour in liquid crystal 104 among both substrates. Generally as an approach of pouring in liquid crystal 104 between said substrates, the vacuum pouring-in method was used. This vacuum pouring-in method is explained.
[0004] First, as shown in said translucency substrate 101 (or 102) at drawing 5 , a sealant 105 is formed in the part except the liquid crystal inlet 106 around the display 107 of a liquid crystal panel. And said liquid crystal inlet 106 is contacted to liquid crystal 104 within the chamber decompressed as both [ these ] the substrates 101 and 102 were shown in lamination and drawing 6 through said sealant 105 and spacer which is not illustrated. In addition, the liquid crystal panel section shown in drawing 6 is a B-B cross section in drawing 5 . Then, by introducing gas or returning the inside of a chamber in said chamber, at atmospheric pressure, the difference of a pressure is produced within and without a liquid crystal panel, and, as a result, liquid crystal 104 is poured in into a liquid crystal panel. At this time, since liquid crystal will be superfluously poured in into a liquid crystal panel, the liquid crystal which applied the pressure to the liquid crystal panel and was superfluously poured into it here is discharged. And by applying the closure resin which finally is not illustrated to the liquid crystal inlet 106 neighborhood, liquid crystal 104 was poured in into the liquid crystal panel, and this was closed.
[0005]
[Problem(s) to be Solved by the Invention] However, when liquid crystal was poured in based on the conventional technique mentioned above and this was closed, there were the following troubles.
[0006] First, although the press machine which has a rigid parallel plate was conventionally used as a means to give a pressure to a substrate when making the liquid crystal poured in superfluously discharge, when said parallel monotonous parallelism was not uniform, the gap between substrates varied, and there was a trouble that will cause a poor display or shock resistance will be inferior. Moreover, when a foreign matter etc. existed on a substrate, the load concerning the part became high in spot, and there was a trouble that display unevenness will occur.
[0007] Moreover, when liquid crystal was closed by applying closure resin to the liquid crystal inlet 106 neighborhood after discharging the liquid crystal poured in superfluously, this closure resin was adheres

to the edge of a liquid crystal panel, and since resin did not permeate the display side of a liquid crystal panel enough, there was a trouble that the closure mistake of liquid crystal will occur.
[0008] In order to discharge the liquid crystal superfluously poured in in JP,5-142506,A in order to prevent this closure mistake, after pressurizing a substrate and applying closure resin to the liquid crystal inlet 106 neighborhood, pressurization is once stopped and the technique of releasing a substrate is indicated.
[0009] However, since the once pressurized substrate was released from pressurization at a stretch according to the technique indicated by said JP,5-142506,A, closure resin permeated the display side of a liquid crystal panel too much, and there was a trouble that a poor display will occur in the liquid crystal inlet 106 neighborhood.
[0010] Without causing a closure mistake, in case it closes after being made in view of the above-mentioned trouble and pouring in liquid crystal, this invention is excellent in the homogeneity of the gap between substrates, does not have display unevenness, and offers the manufacture approach of a liquid crystal panel strong against an external pressure.
[0011]
[Means for Solving the Problem] The manufacture approach of the liquid crystal panel of this invention according to claim 1 The process which sticks the substrate of said pair by the sealant which is the manufacture approach of a liquid crystal panel of coming to carry out the closure of the liquid crystal between the substrates of the pair in which the electrode was formed, and was prepared around the display except a liquid crystal inlet, The process which pours in liquid crystal between said substrates, and the process which discharges the liquid crystal which pressurized said substrate side to liquid crystal extrusion pressure using gas, held only predetermined time amount, and was poured in superfluously, The process which applies closure resin near a liquid crystal inlet, with said liquid crystal extrusion pressure held, The pressure concerning said substrate side is lowered to resin ****** smaller than liquid crystal extrusion pressure, only predetermined time amount is held, and it is characterized by having the process which draws closure resin to a liquid crystal inlet, and the process which stiffens said closure resin.
[0012] Setting the manufacture approach of the liquid crystal panel of this invention according to claim 2 to the manufacture approach of a liquid crystal panel according to claim 1, said liquid crystal extrusion pressure is 0.1 kgf/cm2. It is 1.0 kgf/cm2 above. It is characterized by being the following range and said resin ****** being the or more 1/2 19/20 or less range of said liquid crystal extrusion pressure.
[0013] The manufacture approach of the liquid crystal panel of this invention according to claim 3 is characterized by the holding time of said resin ****** being 5 or less minutes 1 minute or more in the manufacture approach of a liquid crystal panel according to claim 1.
[0014] The manufacture approach of the liquid crystal panel of this invention according to claim 4 is characterized by 15000 or more CPS being 20000 or less CPS by the viscosity of said closure resin in the manufacture approach of a liquid crystal panel according to claim 1.
[0015] Hereafter, the operation by the above-mentioned configuration is explained.
[0016] Since according to the manufacture approach of the liquid crystal panel of this invention closure resin can be drawn to an inlet by lowering a pressure to resin ****** after applying closure resin near a liquid crystal inlet, with liquid crystal extrusion pressure maintained, a closure mistake can be prevented.
[0017] Moreover, to a substrate, since these pressurization is performed using gas, while it is possible to pressurize the whole substrate surface uniformly and being able to suppress dispersion in a gap, though foreign matter adhesion is carried out, generating of the gap unevenness by this can be prevented.
[0018] Moreover, it is said liquid crystal extrusion pressure 0.1 kgf/cm2 While being able to make superfluous liquid crystal discharge completely by considering as the above, it is 1.0 kgf/cm2. Generating of vacuum air bubbles can be prevented by considering as the following. Moreover, said resin ****** can draw closure resin to a liquid crystal inlet certainly by carrying out to 19/20 or less while being able to prevent drawing closure resin to the display of a liquid crystal panel by carrying out to 1/2 or more [ of said liquid crystal extrusion pressure ].

[0019] Furthermore, while being able to draw closure resin to a liquid crystal inlet still more certainly by holding said resin ****** 1 minute or more, it can prevent certainly drawing closure resin to the display of a liquid crystal panel by considering as 5 or less minutes.
[0020] Furthermore, while being able to prevent closure resin becoming is easy to be drawn to the display of a liquid crystal panel by setting viscosity of closure resin to 15000 or more CPS, time amount until closure resin is drawn to an inlet can be shortened by being referred to as 20000 or less CPS.
[0021]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using drawing 1 thru/or drawing 3 .
[0022] Drawing 1 (a) - (e) is the flow Fig. showing the manufacture approach of the liquid crystal panel of this invention, and drawing 2 (a) - (e) shows the A-A sectional view in drawing 1 .
[0023] First, as shown in drawing 1 (a) and drawing 2 (a), opposite arrangement of the translucency substrates 1 and 2 with which the electrode which is not illustrated, signal wiring, the orientation film, etc. were formed is carried out, and a sealant 5 is formed and stuck on the part except the surrounding liquid crystal inlet 6 of a display 7.
[0024] Next, said stuck substrate is fixed in a reduced pressure chamber, and as shown in drawing 1 (b) and drawing 2 (b), liquid crystal 4 is contacted to said liquid crystal inlet 6. At this time, liquid crystal 4 is poured in by the differential pressure of liquid crystal panel inside and outside into a liquid crystal panel, and goes by it.
[0025] Next, after sealing the open air on both sides of the substrate of a pair with which liquid crystal 4 was poured in to the pressurization closure jig 9 in order to make the liquid crystal 4 poured in superfluously discharge as shown in drawing 1 (c) and drawing 2 (c), gas is introduced in this pressurization closure jig 9, said substrate side is pressurized by the predetermined pressure, and fixed time amount maintenance is carried out. In addition, said pressurization closure jig is omitted in drawing 1 (c). Thus, since the substrate is pressurized using gas in this invention, it is possible to perform uniform pressurization all over a substrate, and the homogeneity of a gap can be raised. In addition, the pressure in the pressurization closure jig 9 at this time is called liquid crystal extrusion pressure in the following explanation.
[0026] Next, as shown in drawing 1 (d) and drawing 2 (d), after discharging the liquid crystal poured in superfluously, in order to close liquid crystal 4, closure resin 8 is applied to the liquid crystal inlet 6 neighborhood.
[0027] Next, as shown in drawing 1 (e) and drawing 2 (e), a little pressure in the pressurization closure jig 9 is lowered, said closure resin 8 is drawn in the liquid crystal inlet 6, fixed time amount maintenance is carried out, and said closure resin 8 is stiffened. In addition, said pressurization closure jig is omitted in drawing 1 (e). Moreover, the pressure in the pressurization closure jig 9 at this time is called resin ****** in the following explanation.
[0028] Thus, in the manufacture approach of the liquid crystal panel of this invention, since it is made to harden after drawing the closure resin 8 applied to the liquid crystal inlet 6 neighborhood according to the difference of this pressure by setting the welding pressure to the substrate after liquid crystal impregnation as two steps of liquid crystal extrusion pressure and resin ****** with a pressure lower than this to the liquid crystal inlet 6, a closure mistake can be prevented. Drawing 3 is drawing showing the pressurization profile to the substrate after liquid crystal impregnation, and the profile of this invention in which a continuous line has two steps of welding pressure, and a broken line are the conventional pressurization profiles.
[0029] In addition, at the process in above-mentioned drawing 1 (c) and drawing 2 (c), since the homogeneity of the gap between a substrate 1 and 2 changes with the holding times in liquid crystal extrusion pressure or this pressure, it is necessary to carry out by the optimal pressure and the optimal holding time. Then, this invention person obtained the result shown in Table 1 and Table 2, as a result of examining the holding time in liquid crystal extrusion pressure or this pressure using various numeric values.
[0030]

[Table 1]

| 液晶押出圧 | ギャップむら | 真空気泡 | 評価 |
|---|---|---|---|
| 0.09Kgf/cm² | × | ○ | × |
| 0.10Kgf/cm² | ○ | ○ | ○ |
| 0.50Kgf/cm² | ○ | ○ | ○ |
| 0.80Kgf/cm² | ○ | ○ | ○ |
| 1.00Kgf/cm² | ○ | ○ | ○ |
| 1.10Kgf/cm² | ○ | × | × |

[0031]
[Table 2]

| 液晶押出圧を加える時間 | 評価 |
|---|---|
| なし | × |
| 5分 | ○ |
| 10分 | ○ |

[0032] As shown in Table 1, about liquid crystal extrusion pressure, it is 0.1 kgf/cm2. If it is the following, gap unevenness will occur. This is because sufficient pressure effect is not acquired with the rigidity of the translucency substrates 1 and 2 which consist of glass, a plastic, etc. and superfluous liquid crystal cannot be discharged. Moreover, 1.0 kgf/cm2 Since vacuum air bubbles will be generated in a liquid crystal panel if large, liquid crystal extrusion pressure is 0.1 - 1.0 kgf/cm2. Then, superfluous liquid crystal can be discharged, without causing generating of gap unevenness which was mentioned above, and vacuum air bubbles.
[0033] Moreover, since superfluous liquid crystal cannot be made to discharge enough but gap unevenness arises with it being less than 10 minutes about the holding time of liquid crystal extrusion pressure, it is desirable for at least 10 minutes to make it hold. If this holding time is lengthened, so superfluous liquid crystal can be made to discharge completely, but when productivity is taken into consideration, considering as 30 or less minutes is desirable.
[0034] Moreover, also in the process in above-mentioned drawing 1 (d) and drawing 2 (d), since how closure resin 8 is drawn by resin ****** and the holding time in this pressure differs, it is necessary to carry out by the optimal pressure and the optimal holding time. Then, this invention person obtained the result shown in Table 3 and Table 4, as a result of examining the holding time in resin ****** or this pressure using various numeric values.
[0035]
[Table 3]

| 液晶押出圧に対する樹脂引込圧の割合 | 評価 |
|---|---|
| 1／2より小さい | × |
| 1／2 | ○ |
| 19／20 | ○ |
| 19／20より大きい | × |

[0036]
[Table 4]

| 樹脂引込圧を加える時間 | 評価 |
|---|---|
| 30秒 | × |
| 1分 | ○ |
| 5分 | ○ |
| 6分 | × |

[0037] That is, about resin ******, if it is less than [ of said liquid crystal extrusion pressure ] 1/2 Since closure resin 8 permeates to a display, closure resin 8 will not be completely drawn if larger than 19/20 of said liquid crystal extrusion pressure, but a closure mistake occurs Resin ****** can close liquid crystal 4, without drawing 1 / 2 - 19/20 of liquid crystal extrusion pressure, then closure resin 8 to a display, or causing a closure mistake.
[0038] Moreover, since closure resin 8 will permeate to a display if a closure mistake occurs without drawing closure resin 8 completely as it is less than 1 minute and 5 minutes is exceeded about the holding time of resin ******, as for the holding time of resin ******, it is desirable for 5 or less minutes to take 1 minute or more.
[0039] In addition, said resin ****** does not necessarily need to be fixed among the holding time, and you may make it give two or more pressures gradually.
[0040] Moreover, what is necessary is just to make it set up suitably resin ****** and the holding time which were mentioned above according to each viscosity, although how closure resin 8 is drawn changes also with viscosity of this closure resin 8. However, since a display side is permeated by fluctuation of few pressures when viscosity is too low, it is desirable to be referred to as 15000 or more CPS. Moreover, in order to require time amount most if viscosity is too high, in order to draw resin, it is desirable to be referred to as 20000 or less CPS.
[0041]
[Effect of the Invention] Since closure resin can be drawn to an inlet by lowering a pressure to resin ****** according to the manufacture approach of the liquid crystal panel of this invention after applying closure resin near a liquid crystal inlet, with liquid crystal extrusion pressure maintained as explained above, the effectiveness that a closure mistake can be prevented is done so.
[0042] Moreover, since said pressure is performed using gas, though it is possible to pressurize the whole substrate surface at homogeneity, gap precision can be raised and foreign matter adhesion is carried out at the substrate, the effectiveness that generating of the gap unevenness by this can be prevented is done so.
[0043] Moreover, it is said liquid crystal extrusion pressure 0.1 kgf/cm2 While being able to make superfluous liquid crystal discharge completely, without producing gap unevenness by considering as the above, it is 1.0 kgf/cm2. The effectiveness that generating of vacuum air bubbles can be prevented is done so by considering as the following.
[0044] Moreover, said resin ****** does so the effectiveness that closure resin can be certainly drawn to a liquid crystal inlet, by making it or less into 19/20, while being able to prevent drawing closure resin to the display of a liquid crystal panel by carrying out to 1/2 or more [ of said liquid crystal extrusion pressure ].
[0045] Furthermore, while being able to draw closure resin to a liquid crystal inlet still more certainly by holding said resin ****** 1 minute or more, the effectiveness that it can prevent certainly drawing closure resin to the display of a liquid crystal panel is done so by considering as 5 or less minutes.
[0046] Furthermore, while being able to prevent closure resin becoming is easy to be drawn to the display of a liquid crystal panel by setting viscosity of closure resin to 15000 or more CPS, the effectiveness that time amount until closure resin is drawn to an inlet can be shortened is done so by being referred to as 20000 or less CPS.

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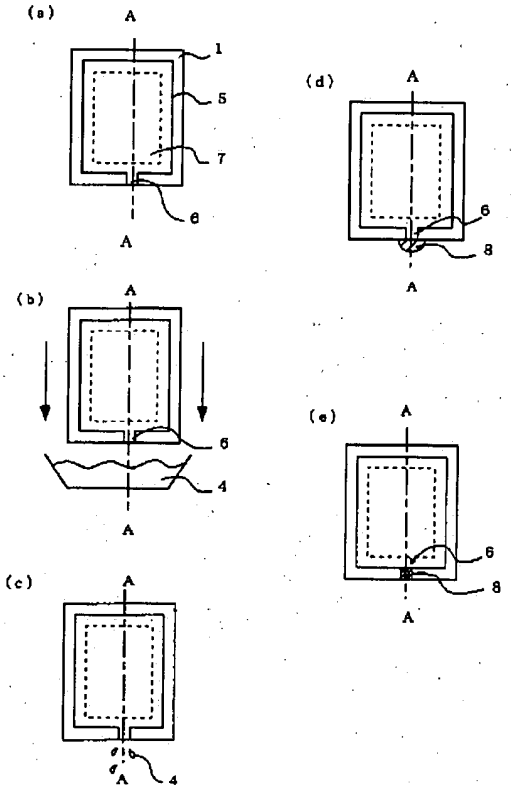
[Translation done.]

Drawing selection Representative drawing




[Translation done.]